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ABSTRACT

Presented is a discussion of three types of teacher competencies: cognitive, performance, and consequence. The study identifies some methods for measuring outcomes in each of the three categories. Also discussed is the problem of designing research studies for investigating teacher effectiveness. (PEB)

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Measuring Teacher Competence

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Teacher competence refers to the capabilities and capacities of teachers, or as Howsam and Houston (1972) state, to their "possession of required knowledge, skills, and abilities." A variety of persons or groups may be interested in measuring teacher competence--

a. teacher educators may wish to determine if objectives of courses or programs are being achieved.

b. teacher licensing agencies may wish to determine if certification standards have been met by applicants.

c. teachers may wish to measure their own skills for purposes of self-improvement.

d. principals, supervisors, or department chairmen may wish to measure teaching skills as part of inservice education efforts.

e. researchers may wish to measure teaching skills in studies of teacher behavior.

f. developers or evaluators may wish to measure teacher competence when validating teacher education materials or procedures.

Thus the range of reasons for measuring teacher competence are wide; measurements may be made of teacher behaviors to answer either local evaluation questions or to establish broad research generalizations. Similarly, the range of persons and organizations interested in teacher competence is wide--a sixth grade mathematics teacher may wish to check on her own skills, a school board may want information about the effectiveness of all reading teachers in a school system, or a state certification

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board may need data on the capabilities of industrial arts teachers in a state. This paper will deal with some of the problems to be faced and procedures to use when any of these individuals or groups attempt to measure the competence of teachers.

Types of Teacher Competencies

Houston and Howsam (1972) describe three types of teacher competencies or outcomes--what teachers know (cognitive), what teachers do (performance), and the results they produce with pupils (consequence). Emphasis on the different competencies may vary from one program to an another. Historically, knowledge and performance have received the most attention but that situation is changing. What pupils are able to do as a result of teacher intervention is a growing concern in teacher training.

Some examples of cognitive, performance, and consequence teacher competencies are shown in Table 1. In some cases a particular competency may not classify cleanly into one of the three categories but they seem sufficiently distinct to aid our thinking when planning, operating, researching, and evaluating teacher training programs.

McNeil and Popham (1973) place special emphasis on the effectiveness of teachers (consequence outcomes) as a measure of their competence. Other outcomes are important too but they feel that assessment of teacher characteristics and performance has been overworked at the expense of measuring teacher accomplishment. An argument can be made, however, for concern by educators about each of the three types of teacher outcomes. For many skills the three outcomes may be logically related to one another--certain knowledge (cognitive) is necessary for certain teacher classroom behavior (performance) which is, in turn, necessary for certain pupil

TABLE 1

Examples of Three Types of Teacher Competencies

Type of Competency	Examples
cognitive	a. writes objectives that include conditions, behavioral terms, and levels of acceptable performance b. describes objectives, rationale, required classroom conditions, and materials for two commercial curriculum programs c. identifies the intellectual development stages of children and characteristics associated with each.
performance	a. develops and administers diagnostic tests to obtain data on pupil achievement of objectives b. selects classroom activities differentially for students based on their interests, aptitudes, and previous achievement c. uses questions from each level of the cognitive taxonomy during classroom discussions
consequence	a. presents evidence of attitude gain for at least half the students on two units b. obtains 80% achievement or better from all students on a standardized teacher performance test c. presents evidence to show at least one year gain for 80% of students on arithmetic skills subtest of ITBS.

achievement (consequence). In Table 2, two examples are given that show logically related cognitive performance, and consequence outcomes. Training and evaluation would focus on the cognitive outcome first, next the performance level and then move to the consequence level because of a presumed (and testable) hierarchical relationship between achievement by teachers at each of the levels.

TABLE 2

Logically Related Teaching Behaviors

Type of Competency	Skill Area	
	Question Asking	Diagnostic Evaluation
consequence	Demonstrate that X% of pupils answer X% of questions on a test following a classroom discussion.	Identify the specific learning difficulties of pupils on the objectives for a unit from results of a diagnostic test.
↑ performance	Ask at least X questions from each level of Bloom's Taxonomy during a classroom discussion.	Prepare and administer diagnostic tests to pupils on the objectives for a lesson.
↑ cognitive	Write and identify questions for each level of Bloom's Taxonomy.	Describe characteristics of a formative or diagnostic test.

Sources of Teacher Competencies

A number of teacher education programs have specified the behaviors or competencies they expect trainees to acquire. The model elementary teacher training programs financed by the federal government are examples of this. Catalogs of competencies have also been compiled from which teacher educators may select outcomes for a local program (e.g., Dodl,

et. al., 1971 or Turner, 1973). Usually these collections of teacher education objectives or competencies are broad statements (e.g., the teacher provides opportunities for students to use the process skills of science) that require the user to define circumstances under which the skills will be exhibited and specific behaviors that define achievement of the competency.

Measuring cognitive outcomes

Most cognitive outcomes of teacher training can be assessed with paper and pencil tests and without access to pupils or classrooms. Such tasks as writing performance objectives, describing intellectual development stages, identifying sources of teaching materials, or describing procedures for pupil motivation are included here.

Cognitive outcomes include some of the planning skills of teachers (such as writing objectives or identifying teaching materials) and knowledge about classroom procedures (such as describing alternative methods for motivating students or identifying uses of formative and summative tests). In some cases cognitive teaching skills may be taught and assessed by using audio or video tapes of actual classrooms. For example, audio recordings of classroom discussions may be used to teach and assess the skill of identifying different types of teacher questions. A video tape of a classroom may be used to teach and assess the ability to identify reinforcing words and actions of a teacher.

Measuring performance outcomes

Performance outcomes are the doing skills of teaching. Many, but not all, require a classroom setting while they are learned and assessed. For example, performance competencies such as using a variety of questions,

administering tests of intellectual stages to children, tutoring students, and conducting discussions are all interactive teaching skills. If they are not learned and assessed in regular classrooms a substitute such as peer teaching among teacher candidates is needed.

Another category of performance outcomes may be learned apart from classrooms. Preparation of teaching units, operation of audio visual equipment and identification of learning difficulties from pupil diagnostic tests are all tasks that a teacher performs either before or after pupils study. Although these skills may be learned and assessed apart from an actual classroom their relevance may be related to the context in which they are learned. Thus it may be helpful (but not necessary) to learn these in a field setting to heighten their significance to teacher trainees.

Observation instruments developed for coding teacher-pupil verbal interactions such as Flanders interaction analysis (1970) are important tools for measuring teacher performance. Desired performance levels or patterns of outcomes on the observation instruments can be established and used to assess teacher behaviors. Preparation of video or audio tape recordings of lessons may be used to capture the performance of a teacher for later performance assessment.

Worthen (1968) and Ciesla (1973) report on instruments used to measure the use of a particular teaching strategy in a classroom. Both verbal (e.g., the kinds of responses to pupil questions) and non-verbal (e.g., frequency of diagnostic tests) aspects of teaching are included in the Worthen and Ciesla instruments. Both of the instruments were used in research studies of teacher behavior but would be suitable for monitoring the performance of teachers and providing feedback while they attempt to learn a teaching strategy.

The general strategy for measuring performance competencies of teachers is to develop or locate observation instruments or rating scales that includes items on all of the aspects of the teaching performance that are important. The teaching performance itself (e.g., a classroom lecture) or the product of the performance (e.g., a set of individualized instruction plans) is then assessed with the chosen instrument.

Measuring consequence outcomes

Teaching is carried out so pupil behaviors will be changed. To measure consequence outcomes is to determine how teacher actions have affected pupil behaviors. Thus, measures of cognitive achievement, affective or attitude scores, and psychomotor skills of pupils are all potential consequence measures of teacher competence.

Consequence measures can be as diverse as the objectives teachers attempt to accomplish. If a teacher is attempting to get students to successfully add and subtract fractions then a posttest on the skills will indicate the degree to which both the pupils and the teacher have been successful. Similarly, if a teacher has set the objective of increasing voluntary use of the library then discreet checks on the level of pupil library use will be the means of measuring the degree to which the teacher has caused this behavior to occur.

Popham (1973) has developed teaching performance tests to use as consequence measures. Teachers (or teacher trainees) are given a brief written introduction to a topic and one or more performance objectives to accomplish with a class. Then at some later time (say, the next day) the teachers conduct a brief class to attempt to get students to accomplish the objectives. After the class a test on the objectives

(that has not been seen by the teacher) is administered to the students. The students also complete a brief attitude measure to indicate how they liked the lesson. Together, the test on the objectives and the attitude measure can be used to judge the ability of teachers to achieve certain ends.

Consequence outcomes can be measured with standardized teacher performance tests like those developed by Popham or by using whatever objectives, materials, and pupils are available in a local setting. There are advantages and disadvantages to either practice. In either case, the major concern with measuring consequence outcomes is the degree to which teachers can be held accountable for and evaluated by the performance of their students. Little is know about how to adjust expectations of teacher success when they work with pupils that have different entering abilities, backgrounds, aptitudes, motivation, and learning rates. Differences in subject matter difficulty, instructional materials, and classroom settings may also have important effects on pupil achievement and, therefore, teacher consequence measures.

Efforts to measure teachers in terms of what they can accomplish with pupils seem to be correctly directed. Teachers should be evaluated by what their pupils can do. At the same time, however, using pupil outcomes as the only criterion of teacher competence seems foolish. Until greater knowledge of cause and effect relationships between teacher and pupil behavior is available we should be cautious about demanding ends from teachers when we can not provide them with the means of accomplishing them.

Designs for measuring teacher competence

Suppose that a university requires teacher candidates to present evidence of their effectiveness before they will be recommended for licensing. Or, suppose that a researcher seeks data to show a cause and effect relationship between teacher questioning skills and pupil achievement. What kind of data will be acceptable in each case? Questions about acceptable evidence arise in every effort to measure the competence of teachers.

To get at the question of acceptable evidence, it is useful to distinguish procedures for answering questions of local concern from those for establishing broad generalizations. The distinction is important because teachers and persons concerned with conducting teacher education programs often need answers to questions of only local interest. On the other hand, researchers, developers and evaluators are often concerned with answering questions of interest to a wide audience. The procedures used to obtain acceptable evidence in one situation may be different from those in the other.

Campbell and Stanley (1963) describe a number of designs for conducting research and evaluation. Among their designs are those for conducting true experiments (Posttest-Only Control Group Design, Pretest-Posttest Control Group Design, and the Solomon Four-Group Design). The true experimental designs each contain one or more control groups that assist in obtaining valid conclusions. For any attempt to establish generalizations about teaching and learning use of these true experimental designs is desirable. To do otherwise allows for alternative explanations of findings.

Consider the case mentioned previously in which a researcher wishes to show a direct relationship between teacher questioning skills and pupil achievement. Teachers can be selected and randomly assigned to two groups. The questioning skills of teachers in both groups and the achievements of pupils in their classes are measured for a short unit. Teachers in one of the groups then study special materials and learn to use certain question asking skills. Following this, both groups of teachers teach an additional unit. Teacher questioning skills and pupil accomplishment are again measured. If the results show that teachers and student behaviors for the two groups were similar before acquiring the new questioning skills and different after doing so, strong statements can be made about the relationship between teacher questioning skills and pupil achievement.

Now consider a case in which decisions on teaching effectiveness are to be made about the teachers in a field-based program for prospective mathematics teachers. As part of a student teaching assignment each prospective teacher must teach a two week unit in which at least 80% of the pupils accomplish 80% of the objectives. The regular classroom teachers have responsibility for monitoring the collection of final test results and altering the standards in unusual circumstances (e.g., for high ability students). Is it essential in this situation that true experimental designs with pretests and control groups be used to show that the task has been accomplished? Of course not. The design referred to by Campbell and Stanley (1963) as a One Shot Case Study would be quite acceptable. Objectives and testing procedures are set, the teacher teaches, and pupils are examined. If the objectives and testing procedures are judged acceptable by the regular classroom

teacher and the 80-80 criterion is met all is well. No fancier procedures are needed to answer the question of whether the prospective teacher meets the criterion of demonstrated effectiveness.

To summarize the argument, experimental designs are important for researchers, developers, and evaluators that wish to answer questions that apply to an audience beyond the one being studied. If teachers, principals, supervisors, and operators of teacher education programs wish to answer questions that apply only to their own situations, considerably less rigor is needed in the designs used to collect the data. Campbell and Stanley's (1963) One Shot Case Study and One Group Pretest-Posttest Design are quite adequate for local evaluation efforts.

An intermediate type of design that has some application are quasi-experimental designs (Campbell and Stanley, 1963). These allow for more control than the one group evaluation designs just described but are less difficult to arrange than true experimental designs when conducting field research. An important feature of some of the quasi-experimental designs is that teachers can serve as their own comparison or reference points in a study. Examples of how quasi-experimental designs can be used to measure teacher competence are given in Okey and Ciesla (1973).

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